Lung Volume Reduction Surgery (LVRS)

For the treatment of emphysema

UW Medicine
UNIVERSITY OF WASHINGTON
MEDICAL CENTER

Lung volume reduction surgery (LVRS) removes lung parts that have been damaged by emphysema. This handout describes the process of being considered for LVRS at University of Washington Medical Center (UWMC). It explains what to expect before, during, and after surgery.

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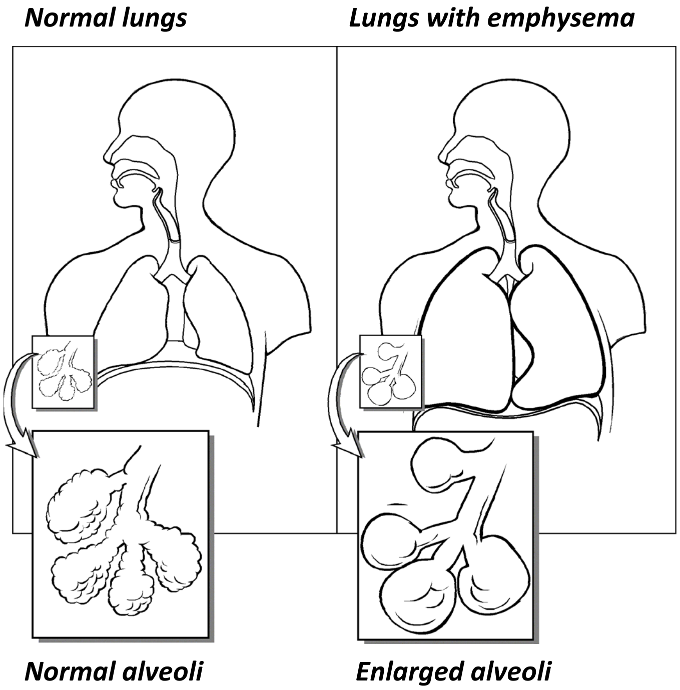
What is emphysema?

Emphysema is a type of *chronic obstructive pulmonary disease* (COPD). Healthy lungs inflate and deflate like a balloon, but COPD blocks this normal airflow in the lungs. The most common cause of emphysema is smoking cigarettes.

With emphysema, the lungs lose their ability to return to their normal size. The lungs become stretched out and air gets trapped in the small air sacs (*alveoli*). This trapped air makes it hard for the lungs to exchange oxygen and carbon dioxide. This causes shortness of breath, or *dyspnea*.

Overstretched lungs also take up too much room in the chest cavity. This makes the *diaphragm* (the muscle that controls breathing) less effective. The pictures below show an example of lungs with emphysema.

There is no known cure for emphysema, but *lung volume reduction surgery* (LVRS) may give you relief from the symptoms.



What is LVRS?

LVRS is a surgery to remove the most damaged parts of your lungs. The surgeon will decide how much and which part of your lungs to remove by looking at your *chest CT scan* and *perfusion scan.* A CT (computed tomography) scan uses X-rays to see inside your body, and a perfusion scan shows the blood flow to each area of the lung. By removing the most damaged parts of your lungs, the rest of your lungs have more room to expand. This may:

- Reduce your shortness of breath.
- Increase your ability to exercise.
- Improve your quality of life.

About Your Surgery

UWMC surgeons use two types of surgery to perform LVRS:

- **Median sternotomy** – During this surgery you will lie on your back, and the doctor will make a 6-inch *incision* (cut) down the middle of your chest through your breastbone (*sternum*).
- **Video-assisted thoracoscopic surgery (VATS)** – You will lie on your side, and the doctor will make 3 incisions along the side of your chest. These incisions are about 1 – 1 ½ inches long, and do not go through bone or muscle. The surgical tools and *endoscope* (a small video camera) go through the incisions. Then this is done on the other side of your chest.

Both types of surgery have the same long-term results. Your surgeon will decide which type of surgery is best for you.

LVRS does not cure emphysema. You will still have emphysema in the remaining lung tissue, and we do not know how long the benefits of LVRS will last. You will still need to use your inhalers and other breathing medicines and continue to see your lung doctor.

Many patients hope to stop using extra oxygen after surgery. Some patients stop using oxygen after surgery, but others still need it. We cannot know before surgery if you will be able to stop using oxygen.

Risks

All procedures involve some risks. Talk with your care team if you have any questions about the risks and benefits of having surgery. Some of the risks of LVRS include:

- Pneumonia or other infections.
- Ongoing air leak from the lungs, or a collapsed lung (*pneumothorax*).
- Heart attack or irregular heartbeats.
- Bleeding, which requires a blood *transfusion* (getting extra blood) or another surgery.
- Stroke or blood clots.
- Ongoing need for the *ventilator* (the machine that breathes for you during surgery).
- Problems with the intestines (*bowel*), such as bleeding or blockage.
- Long hospital stay.

The risk of dying after LVRS are:

- **Nationally:**
  - About 4 out of 100 patients (4%) die within 30 days after surgery.
  - About 8 out of 100 patients (8%) die within 90 days after surgery.
- **At UWMC:**
  - About 2 out of 100 patients (2%) die within 30 days after surgery.
  - About 6 out of 100 patients (6%) die within 90 days after surgery.

Screening to Determine Eligibility for LVRS

First Contact

After you request information about our program or if we receive a referral from your doctor, your first contact with staff in the LVRS program will probably be a phone call. We will talk with you about the information in this handout and answer your questions. We will also ask you for:

☐ **Contact information** – your mailing address and phone number(s).

☐ **Insurance** – your primary health insurance coverage and any other health insurance plans you have. Most insurance plans cover LVRS, but some need pre-authorization before screening tests.

☐ **Healthcare providers** – the name and contact information of your primary care doctor, lung doctor, and other providers you see regularly.

☐ **Support system** – your family and close friends. Who can support you if you have surgery?

☐ **Medical history** – diseases you have now or have had treatment for (such as cancer), and any past hospital stays.

☐ **Surgical history** – any operations (surgeries) you have had, especially in your chest.

☐ **Height and weight** – measured ***without*** shoes. Your BMI (body mass index) tells us the amount of body fat you have. Your BMI must be below a certain number to qualify for surgery. If you are overweight, we will tell you the weight you must reach before surgery.

☐ **Smoking history** – Do you smoke cigarettes, cigars, or pipes or vape e-cigarettes now, or when did you quit? How much did you smoke, and for how long? Are you currently using any products to help you stop smoking, like nicotine gum or patches? You must not be smoking or vaping nicotine or any other substance (such as marijuana) for at least 4 months before you can have surgery. You also cannot use any nicotine products such as gum, pouches, or patches.

☐ **Coughing and sputum** – How often do you cough? Do you cough up *sputum* (phlegm or mucus) from your lungs? If so, how much and what does it look like?

☐ **Medications** – the name and amount of the medications you usually take, and why you take them. We also need to know about any over-the-counter drugs, vitamins, and herbal supplements you take that are not prescribed by your doctor.

☐ **Medication allergies** – any medications you cannot take and why you cannot take them.

☐ **Oxygen** – Do you use supplemental oxygen? If so, how much, and when?

☐ **Activity** – Do you exercise every day? Have you been in a *pulmonary* (lung) rehab program before? Does your breathing problem limit your daily activities?

Baseline Screening

To find out if you are eligible for LVRS, you need to do some screening tests. Your primary care or lung doctor may refer you for these tests. You can do these near your home if your local hospital or clinic is set up to do them. If you have done these tests in the past 6 months, you do not have to do them again. The baseline screening tests are:

- **Full pulmonary function testing** – breathing tests that include:
  - Spirometry pre- and post-bronchodilator (tests breathing before and after using an inhaler)
  - Post-bronchodilator lung volumes in a body box (lung test in a special booth after using inhaler)
  - Diffusing capacity (measures how well your lungs move oxygen into your blood)
- **Room air arterial blood gas measure** – a blood draw from your wrist while you are **NOT** using supplemental oxygen.
- **High resolution and spiral chest computed tomography (CT) scan** – a special X-ray of the lungs.
- **Echocardiogram** – a picture of the heart taken using ultrasound.

After we have your test results and health records and talk to you on the phone, our Emphysema Surgery Committee will review your case. This committee includes our *thoracic* (chest) surgeons, and a nurse coordinator. The committee will decide if you are eligible for LVRS. We will send a letter to the doctor who referred you to us and tell them if you are eligible.

Next Steps

- If your tests show that you are eligible for surgery, our letter to your doctor will include our recommendations for next steps. These may include: **Pulmonary rehabilitation** ("rehab") – a special exercise program (see details on page 5).
- **6-minute walking tests** – at the beginning and end of rehab.
- **Lung perfusion scan** – measures the blood flow to your lungs. This test will not be done until you come to UWMC.
- **Cotinine blood level** – a lab test to confirm that you do not smoke or use nicotine products
- **Dobutamine stress test** – a test of the heart that requires injections of a drug called dobutamine, to increase your heart rate, and a radioactive dye used to take pictures with a special camera.
- **Right and/or left heart catheterization** – studies to check the pressure in your heart and look for narrow or blocked blood vessels. If the echocardiogram or stress test show signs of heart disease or high blood pressure in your lungs, you will need to see a *cardiologist* (heart doctor) for this test.

Pulmonary Rehabilitation

All patients being considered for LVRS must complete pulmonary rehabilitation, or "rehab." This program includes classes and exercise led by nurses, physical therapists, exercise specialists, and respiratory therapists.

The goal of rehab is to help you get stronger and breathe better before surgery, which will make your recovery easier. Pulmonary rehab usually lasts 6 to 12 weeks.

Exercise Sessions

You will need to do 2 to 3 exercise sessions per week, and a total of at least 16 sessions. In these sessions you will use different types of exercise equipment such as a treadmill or stationary bicycle. You will learn how to use this equipment safely, and practice breathing techniques. The rehabilitation team will check blood pressure, blood oxygen levels, and heart rate before, during, and after exercise.

You and the rehab team will set goals to gradually increase your endurance. You will also do exercises at home on days you do not attend classes.

By the end of rehab, your goals are to:

- Walk on a treadmill at a comfortable pace for at least 20 minutes, without stopping.
- Walk at least 460 feet during the post-rehab 6-minute walk test.

Classes

Pulmonary rehab classes are taught by a team that includes rehab staff, pharmacists, dietitians, and psychologists. Your classes will cover at least 12 different topics. Topics may include:

- Lung anatomy and physiology
- Breathing medicines
- Oxygen use and equipment
- Breathing retraining
- Secretion clearance and management
- Nutrition and weight management
- Energy conservation
- Stress and depression management and relaxation techniques
- Travel and the environment
- Managing your health and healthcare
- Advance directives

Your lung doctor will refer you to a rehab program locally. Our nurse will work with the rehab coordinator to make sure that your program meets the surgery requirements.

Final Screening at UWMC

After you complete your tests and pulmonary rehab, we will schedule your visit to UWMC. During this visit you will do some final screening tests and meet with your surgeon. This doctor will talk with you about your screening and test results. They will discuss your eligibility for surgery, and what results to expect after surgery. If you are eligible and decide to have the surgery, we will set your surgery date and schedule your pre-surgery appointments.

Before Surgery

You will meet with the surgery team to discuss and sign the surgery consent form. You can ask the team any questions you have. After your questions are answered and you have signed the consent form, you will:

- Have a physical exam.
- Learn how to prepare for surgery. The clinic nurse will give you important medication instructions and tell you when to stop eating and drinking.
- Meet with the anesthesia team by phone to discuss the type of *anesthesia* you will have. Anesthesia is medicine to help you sleep and feel no pain during surgery.
- Have blood drawn to check your electrolytes and blood counts. We will check your blood type in case you need a blood *transfusion* (extra blood) during or after surgery.

Day of Surgery

On the day of your surgery you will be admitted to the hospital. In the pre-surgery area:

- You will have *intravenous* (IV) lines placed in your veins for fluids and medicines.
- We will place a *catheter* (tube) to drain urine from your bladder.
- We will monitor your vital signs and give you medicine to help you relax.
- We will take you to the operating room, where the anesthesiologist will:
  - Give you *anesthesia* (medicine to help you sleep).
  - Place a tube down your throat into your airway to help with breathing.
  - Monitor your vital signs such as blood pressure, heart rate and rhythm, and blood oxygen levels.
- The surgery takes about 1 to 2 hours.

After Surgery

Right after your surgery:

- Your breathing tube will be removed.
- We will take you to the recovery room where you will wake up.
- We will use special equipment to keep you safe and comfortable. The box on the right explains what you will see after surgery.

When you are stable, you will go to the intensive care unit (ICU).

Medical Equipment:

IV lines: small tubes in your arm and neck to give you fluid and medicine and to monitor your vital signs.

Epidural catheter: a small tube in your back that is used to give you pain medicine.

Telemetry monitor: sticky patches on your chest attached to wires. These monitor your heart.

Foley catheter: a tube in your bladder to drain urine.

Chest tubes: 4 drains that come out of your chest, attached to a suction machine. They remove old blood and keep your lungs inflated until they heal.

Oxygen mask: to give you extra oxygen.

Sequential compression devices (SCDs): inflatable stockings worn on your legs that squeeze off and on to prevent blood clots.

Protecting Your Incision

If you had a median sternotomy (see page 2):

- You will learn how to move while using “sternal precautions.” These instructions will help you protect your incision.
- After surgery, your breastbone will be held together with wires, which will stay in your chest. It will take several weeks for the 2 pieces of the breastbone to heal and grow together. During this time, you must avoid movements that could stretch or pull the incision. To protect yourself, we will teach you to:
  - Hug a pillow to your chest when you cough. This is called *splinting* and will help reduce discomfort.
  - Avoid lifting items heavier than **10 pounds** for 6 weeks after surgery.
  - Use your legs for support instead of your arms when moving in bed or standing up from a chair.

What to Expect During Your Hospital Stay

Your nurse or respiratory therapist will teach you how to clear mucus from your lungs to prevent pneumonia. You will most likely stay in the ICU for 1 to 2 nights until the surgeon decides you are ready to move to a private room in the cardiothoracic surgery unit.

Eating and Digestion

After surgery you will start eating again. You will start with liquids and slowly add solid foods as you can tolerate them. You may have an upset stomach (nausea) from the anesthesia and other medicines. We can give you medicine to help with this. It may take several days for your bowels to start working normally again.

Exercise

We will help you start exercising as soon as possible. First you will sit on the side of the bed for a few minutes, then you will move from the bed to a chair. Your goal is to stay up a little longer each time you get up. We will help you walk in the hallway, and we will show you exercises you can do in your room.

Your Dressing and Medical Equipment

- The dressing on your incision(s) can be removed after 2 days, leaving your incision open to the air.
- When you can walk to the bathroom, we will remove the catheter from your bladder.
- We will remove your IVs when you do not need them for fluids or medicines.
- The epidural catheter can be removed when you can take pain medicines by mouth.
- The suction on the chest tubes will be gradually removed, but the tubes will stay in place until there is no air leaking from your lungs. The tubes may be removed one at a time or all at once.

Leaving the Hospital

Patients usually stay in the hospital for 7 to 14 days after LVRS. The length of your stay will most likely depend on how long it takes your lungs to stop leaking air.

Sometimes patients are well enough to leave the hospital but still need help with their care. If this happens, you may need a short stay in a rehabilitation facility or nursing home.

When you are discharged to go home, a family member or friend must be there to help you. Your nurse will review your discharge instructions with you before you leave. This includes information about your medicines, oxygen, any special equipment, pain control, activity limits, and a follow-up visit with your surgeon.

Driving

After your surgery a family member or friend **must** drive you home. You **cannot** drive for 6 weeks after surgery. This is for your safety and your healing because:

- Pain relievers, including narcotics, can make you sleepy and slow down your response time.
- Moving your arms to control the car puts too much pressure on your incision.
- Even low-speed car accidents are dangerous. If your chest hits the steering wheel or airbag, your incision can be damaged.

Follow-up Care

You will have an appointment with your surgeon 1 to 2 weeks after you leave the hospital. If you are healing well, your care may be transferred to your local primary care or pulmonary doctor.

You may return to pulmonary rehab after your surgery to keep you strong and help you recover. The staff will help you do safe exercises while your incisions heal. Recovery from surgery usually takes 6 to 8 weeks. However, your breathing and physical condition may continue to improve for up to 6 months after surgery.

Questions?

Emphysema Surgery Program: 206.598.3724

Published PFES: 2004, 2008, 2025
Clinician Review: 03/2025
Reprints on Health Online: https://healthonline.washington.edu